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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/505,803	02/17/2000	James E Arnold	RA6-021400	7268

7590 12/01/2001

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EXAMINER	
COMPTON, ERIC B	
ART UNIT	PAPER NUMBER
3726	

DATE MAILED: 12/01/2001

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/505,803	Arnold
Examiner	**Art Unit**
Eric Compton	3726

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Sep 17, 2001*

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-12 and 14-26* is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-12 and 14-26* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 6

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Terminal Disclaimer

1. The terminal disclaimer filed on September 17, 2001, disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent 5,956,845 has been reviewed and is accepted. The terminal disclaimer has been recorded.

2. The terminal disclaimer filed on September 17, 2001, disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent 6,049,978 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 17-19, and 21-25 are rejected under 35 U.S.C. 102(a) as being anticipated by Applicant's Admitted Prior Art (AAPA).

AAPA, as found on pages 1-16 of the specification, disclose various methods of forming (and or repairing) metal products, including the cutting edge of cutting tools, comprising, the following steps: forming a substrate blank to near-finished dimensions, performing pre-coating treatments, coating the substrate with a protective coating, and performing post-coating

treatment. Furthermore, it is disclosed that, "Turbine engine airfoil parts, such as vanes, are manufactured to precise tolerances that determine airflow characteristics for the part" (page 16, lines 4-5). Therefore, it is inherent that the dimensional changes, i.e., pre-processed dimensions versus post-processed dimensions, of the part, due to coatings or treatments must be selected precisely and monitored such that the final parts retains precise tolerances. Since, the present invention is concerned with forming a metal product, rather than repairing or restoring a damaged metal product, the dimensions can be selected up-front.

With regards to coating the metal substrate, it is disclosed that "The coating material layer is formed to build-up the metal component to desired finished dimensions and to provide the finished product with various surface attributes" (page 4, lines 11-12). Prior to coating, it is also known to provide a hot isostatic pressing (HIP) treatment to consolidate the metal powder of the casting (see pages 8-9). A protective coating is then applied, using a high-density coating process, for example a Hyper Velocity Oxyfuel (HVOF) plasma thermal spray process (see pages 6-7). Once coated, the metal part may be subjected to another hot isostatic pressing (HIP) treatment in order to eliminate porosity of the coating and optimize the polycrystalline microstructure (pages 13-15). In a case in which a substrate is coated with a metallic overlay and a high temperature corrosion resistant outer layer, the subsequent HIP treatment was performed to "eliminate porosity and creates an inter-diffusion between the outer layer, the overlay and the substrate" (page 15, lines 6-10). Therefore, as recognized by Applicant, it is known to performed a HIP treatment in order to diffusion bond the coating material to the workpiece substrates.

The HIP treatment claimed by Applicant is essentially the same HIP treatment disclosed by AAPA. "HIP treatment is used in the densification of cast metal components and as a diffusion bonding technique for consolidating powder metals. In the HIP treatment process, a part to be treated is raised to a high temperature and isostatic pressure. Typically, the part is heated to 0.6 - 0.8 [60 - 80%] times the melting point of the material comprising the part, and subjected to pressures on the order of 0.2 to 0.5 [20 - 50%] times yield strength of the material. Pressurization if achieved by pumping an inert gas, such as Argon, into a pressure vessel. Within the pressure vessel is a high temperature furnace, which heats the gas to the desired temperature. The temperature and pressure are held for a set length of time, and then the gas is cooled and vented" (see pages 8-9, lines 17-6).

Regarding claim 21, AAPA discloses that the substrate can be a high speed steel cutting tool surface (page 5, line 1).

Regarding claim 22, AAPA notes the use of coating such as Carbide, Cobalt, and TiN on cutting tools (page, 5, line 10).

Regarding claim 23, AAPA notes the coating vanes which are made of a nickel or cobalt-based alloy (page 3, lines 3-4) of the step of coating parts including vanes using HVOF or Detonation Gun coating techniques (page 7, line 12).

Regarding claims 24-25, AAPA notes providing a coating to a cutting tool, such as a drill bit (page 4, lines 18).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 26, is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA).

AAPA, discloses the invention as cited above. However, AAPA does not specifically disclose forming a metal product comprising one of an ice skate blade, snow ski edge, kitchen knife, pen tip, and finishing hook.

Regarding claim 26, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have formed any of these article using the process disclosed by AAPA, since all of these surfaces are subject to wear and would benefits from having a wear resistant coating.

7. Claims 1-12, 14-16 and 20, are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of US Patent 5,156,321 to Liburdi et al

AAPA, discloses the invention as cited above. AAPA, further mentions sintering treatments in the forming metal products. However, AAPA does not specifically disclose performing a sintering treatment before performing a HIP treatment, after the step of coating a metal substrate.

Liburdi et al disclose a method of repairing metal articles. A component is first subjected to a sintering process to prepare the surface. The coated is then coated with a braze alloy. "After the application of the braze alloy, the component is placed under vacuum or in an inert or reducing atmosphere and heated to a temperature similar to that used for partially s cycle, typically in the range of 800° - 1600°C [1472° - 2912°F], preferably 1000° - 1400°C [1832° - 2552°F]. The temperature is selected to be such that the low melting braze will be liquid, and wet the surfaces of the pores in the previously sintered area. The component is held at temperature for a sufficient interval to promote liquid phase sintering, typically 20 minutes to 24 hours. ***Liquid phase sintering is the process by which adjacent particles in a powder mass are consolidated principally by diffusion through a liquid phase present between the particles.*** The component or fabrication is then cooled to room temperature. The component is then given a suitable heat treatment to develop mechanical properties in the joint and the base metal. ***Hot isostatic pressing can be used as part of the heat treatment to close any minor internal porosity.*** Hot isostatic pressing is the process of simultaneously exposing the component to high pressure (10-50 KSI) and temperature greater than 1000 °C [1832°F]" (col 4, lines 12- 34).

Lastly, while the prior art does not specifically note that the sintering process removes trapped gas, by providing a densification step (e.g., sintering) the porosity is nearly eliminated and therefore, any trapped gas that may have been in the void formed by the pores of the material would also be eliminated.

Regarding claims 1, 9, and 20, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have performed a sintering treatment before performing a HIP treatment of AAPA, in light of the teachings of Liburdi et al, in order to better consolidated the coating and increase diffusion between the coating and substrate.

Regarding claims 2, 10, and 15, Liburdi et al disclose that turbines parts are manufactured from nickel and cobalt-based superalloys (col 1, lines 10-12). AAPA discloses that it is known to apply coating by a hyper velocity oxy-fuel (HVOF) thermal spray process, in the manufacture of turbine parts.

Regarding claims 3, 7, and 14, Liburdi et al disclose that the step of sintering heat treatment is performed at a temperature in the range of 800° - 1600°C [1472° - 2912°F], preferably 1000° - 1400°C [1832° - 2552°F], typically 20 minutes to 24 hours.

Regarding claims 4, 8, and 12, both AAPA and Liburdi et al disclose HIP treatments. Liburdi et al noted that the hot isostatic pressing is performed at a high pressure (10-50 KSI) and temperature greater than 1000 °C [1832°F].

Regarding claims 5 and 11, AAPA discloses, that "HIP treatment is used in the densification of cast metal components and as a diffusion bonding technique for consolidating powder metals. In the HIP treatment process, a part to be treated is raised to a high temperature and isostatic pressure. Typically, the part is heated to 0.6 - 0.8 [60 - 80%] times the melting point of the material comprising the part, and subjected to pressures on the order of 0.2 to 0.5 [20 - 50%] times yield strength of the material. Pressurization if achieved by pumping an inert gas, such

as Argon, into a pressure vessel. Within the pressure vessel is a high temperature furnace, which heats the gas to the desired temperature. The temperature and pressure are held for a set length of time, and then the gas is cooled and vented" (see pages 8-9, lines 17-6).

Regarding claims 6, and 16, Liburdi et al disclose that both the sintering layer and the braze coating match the composition of the metal substrate. AAPA discloses that "The coating material layer is formed to build-up the metal component to desired finished dimensions and to provide the finished product with various surface attributes" (page 4, lines 11-12).

Response to Arguments

8. Applicant's arguments filed September 17, 2001, have been fully considered but they are not persuasive.

Applicant argues that AAPA does not disclose forming a metal product having a cutting edge with a durable wear resistant surface. This is clearly not the case as AAPA discloses the similarities between the repairing and forming processes. In the cases pointed out the various procedures can be used for either repairing or forming. Furthermore, AAPA notes the use of wear resistant coating of the cutting surfaces of articles (page 5, lines 7-19), on a turbine blade (page 13, line 14) and on an article substrate to create an inter-diffusion between an overlay and the substrate (page 15, lines 6-10). Therefore, the steps of providing a coating on a cutting edge and forming a durable wear resistant surface are very much well known in the art.

Regarding the sintering process disclosed by Liburdi et al, Applicant is further directed to the additional information concerning the sintering step: "The presence of the liquid phase promotes sintering, resulting in the relatively complete densification of the powder in the joint region. ***After sufficient time to effect full densification, the component of fabrication is cooled. The result of the process is a joint which is 99+% dense (FIG. 1(f))***" (col 3, lines 7-12). As in any process, achieving 100% is nearly impossible.

Lastly, while the prior art does not specifically note that the sintering process removes trapped gas, by providing a densification step (e.g., sintering) the porosity is nearly eliminated and therefore, any trapped gas that may have been in the void formed by the pores of the material would also be eliminated.

Therefore, the rejections above are valid.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on

the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

10. Official documents related to the instant application may be submitted to the Technology Center 3700 mail center by facsimile at (703) 305-3579/3580. Should Applicant desire to submit a DRAFT response to the Examiner by facsimile transmission, then Applicant should contact the Examiner at the number below for instructions concerning the transmission of DRAFT documents. Applicant is reminded to clearly mark any facsimile transmission as "DRAFT" if it is not to be considered as an official response.

11. Any inquiry concerning this communication should be directed to Examiner Eric Compton at telephone number (703) 305-0240.

ebc

November 8, 2001

S. THOMAS HUGHES
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3700